

# FASD: Not just another pretty face

## Effects of prenatal alcohol on brain and behavior

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# Some Definitions

- Teratology - The study of birth defects
- Teratogen - Any agent (e.g. drug) that causes abnormal development
- Behavioral Teratogen - Any agent (e.g. drug) that causes impaired cognitive, affective, social, reproductive, and/or sensorimotor behavior, even in the absence of obvious physical problems

# Fetal soap opera addiction found in babies if mothers watched sagas

By Allan Parachini

Los Angeles Times

LOS ANGELES — Carmen Bank found her 1985 pregnancy rather boring. So, to pass the time, she started doing something she would never have dreamed of: watching a soap opera.

Unexpectedly, she found herself hooked. And so she spent almost every morning in front of her television set, ready for the familiar theme of "Ryan's Hope." After Melissa was born that October, Bank bought a videocassette recorder so she could tape the show when she was too busy to watch.

Bank isn't sure when she discovered the behavior, but, shortly after Melissa was born, Bank realized that the baby seemed to recognize the "Ryan's Hope" theme and would stop fussing when the program began.

"She'd just sit there and watch the whole introduction and then she would start imitating what they do on the show," Bank said. "This has been going on forever."

While this could appear to be one

## SCIENCE & HEALTH



baby's quirky behavior, an Irish medical researcher would argue otherwise.

Working with the babies of women who regularly watch a British soap, the researcher identified a pattern of fetal learning behavior so striking he calls it "fetal 'soap' addiction."

The British medical journal *Lancet* published a description of the phenomenon two weeks ago, in the form of a letter to the editor from researcher Peter Hepper of the Laboratory for Recognition Research at Queen's University of Belfast.

Fetal soap addiction, Hepper explained, consists of behavior after birth indicating that a newborn has become familiar with a soap opera theme while still in the uterus. The behavior includes a baby's clear

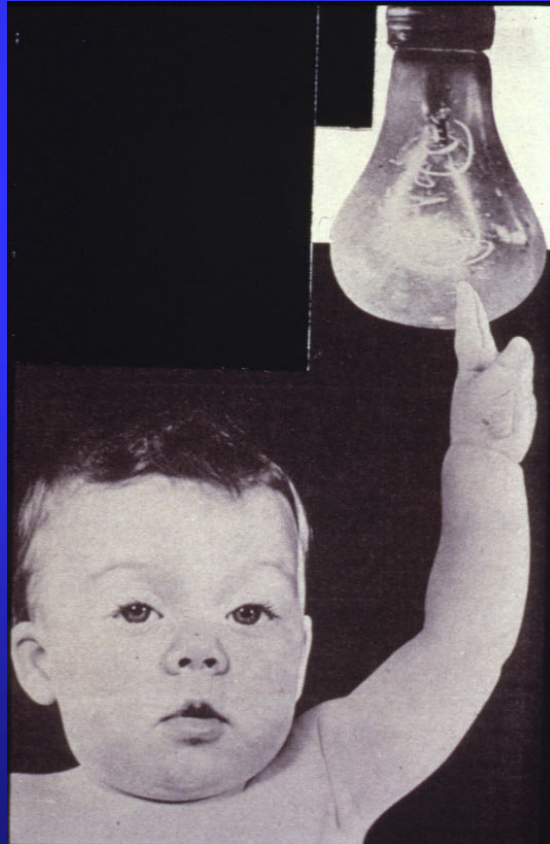
response to the first bars of the tune by focusing rapt attention on the television screen. A crying baby who absorbed the soap theme in the uterus is likely to stop crying when the program begins while the baby of a non-watcher will keep wailing.

Hepper drew these conclusions from a study of the newborns of seven women who regularly watched "Neighbors." Some of the women watched twice daily — at the normal time and then again in repeats during the evening. Their babies were evaluated four or five days after birth. Reactions from infants of a control group of eight mothers who didn't watch the soap were gauged for comparison.

"The results indicate that the reaction of a newborn baby to 'watching' television may reflect long-term exposure to the theme tune of the program during pregnancy," Hepper wrote in the medical journal. "This attention exhibited by the newborn may be a result of prenatal learning."

*Lightning strikes pregnant mom, now...*

# **ELECTRIC BABY LIGHTS BULBS BY TOUCH**



Picture of alcohol bottle deleted  
because of copyright issues.

# Objectives

- Overview FAS and its general features
- Discuss the effects of heavy prenatal alcohol exposure on brain and behavior



# Collaborators and Acknowledgements

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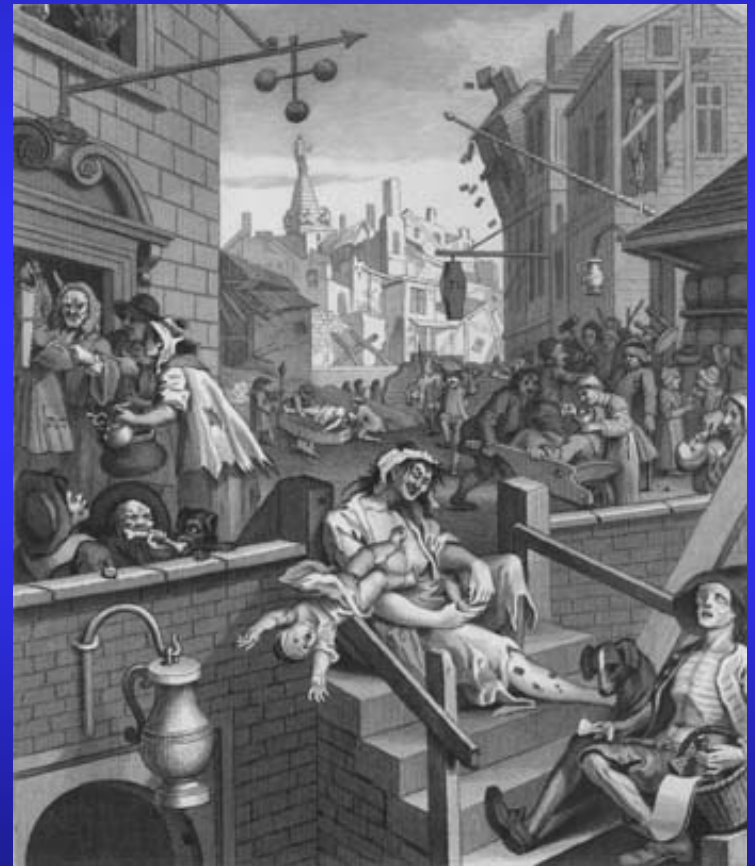
# Historical view of alcohol as a teratogen

- “Foolish, drunken, or harebrain women most often bring forth children like unto themselves”

Aristotle in *Problemata*

- “Behold, thou shalt conceive and bear a son: And now, drink no wine or strong drink.”

Judges 13:7



Rosett, 1984



# Safety of Alcohol and Reproduction in the 20<sup>th</sup> Century

“...the idea of germ poisoning by alcohol in humans may be safely dismissed..

Jellinek, E.M., & Jolliffe, N.  
Journal of Studies on Alcohol 1, 1940

“The offspring of alcoholics have been found defective not because of alcoholism of the parents but because the parents themselves came from a defective stock.”

Journal American Medical Association, 132:419, 1946

## View on the absolute safety of alcohol in pregnancy continued into the 1960's and 70's

- The ethanol drip was used in obstetrics for threatened premature labor.
  - One of few medical uses of ethanol.
  - Involved I.V. ethanol infusion for 6–10 hours, reaching BAC as high as 160 mg/dl
    - ◆ First report — Fuchs, F., et al., *Am. J. Obstet. Gynecol.*, 99:627 (1967)

THE LANCET, NOVEMBER 3, 1973

THE LANCET, NOVEMBER 3, 1977

RECOGNITION OF THE FETAL ALCOHOL  
SYNDROME IN EARLY INFANCY

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**Summary** Historical reports indicate that the observation of an adverse effect on the fetus of chronic maternal alcoholism is not new. Three additional cases of the fetal alcohol syndrome have been recognized in two newborn infants and a 2-month-old baby. The inborn nature of the primate-onset growth deficiency was further confirmed. The first necropsy performed on a fat infant with fetal alcohol syndrome disclosed serious morphogenesis of the brain, which may be responsible for some of the functional abnormalities and the joint malposition seen in this syndrome.

### Transcriptional activation

**Introduction**

A pattern of altered growth and morphogenesis has lately been described in eight offspring of chronic alcoholic mothers.<sup>1</sup> We call this disorder the "fetal alcohol syndrome". The purpose of this report is to present clinical evidence which indicates that fetal malformation associated with chronic alcohol consumption is a new and distinct entity.

AVENIR DES ENFANTS DE MÈRES ALCOOLIQUES  
(ÉTUDE DE 105 CAS RETROUVÉS À L'ÂGE ADULTE)  
ET QUELQUES CONSTATATIONS  
D'INTÉRÊT PROPHYLACTIQUE

P. LEMOINE Ph

**LORD OF THE FLIES**

**PERFORMANCE**

**Personal growth deficits**

**Personal growth deficits - Developmental Areas**

**Conclusion**

**PATTERNS OF MALFORMATION IN  
OFFSPRING OF DRINKING ALCOHOLIC  
MOTHERS** David W. Smith  
University of Illinois at Chicago

FATHER OF THE  
SUFFERING OF MOTHERS

KENNETH L. JONES      DAVID W. SMITH  
CHRISTY N. VILLARD  
AND PETERSON STROMBERG  
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...unrelated children of three  
groups, all born  
...have a similar  
...condition

**Summary** Eight unrelated children of three different ethnic groups, all born to mothers who were chronic alcoholics, have a similar pattern of neonatal, infant, and childhood defects associated with congenital

features identified in the first four patients, while the remaining two affected children were ascertained because their mothers were chronically alcoholic.

The mothers of the affected patients in 1973, the criteria for alcoholism as published in Alcoholism: Criteria Committee, National Council on Alcoholism. Complications and duration of maternal alcoholism as well as general background information are outlined in table 1. All drank excessively throughout the pregnancy, the mothers of patients 4 and 7 to the extent that they were in hospital with delirium tremens. Patient 3 was born while her mother was in an alcoholic stupor. None of the mothers

# Fetal Alcohol Syndrome

- Specific pattern of facial features
- Pre- and/or postnatal growth deficiency
- Evidence of central nervous system dysfunction



Photo courtesy of Teresa Kellerman

# Facies in Fetal Alcohol Syndrome

Discriminating Features

Short palpebral fissure

Indistinct philtrum

Thin upper lip

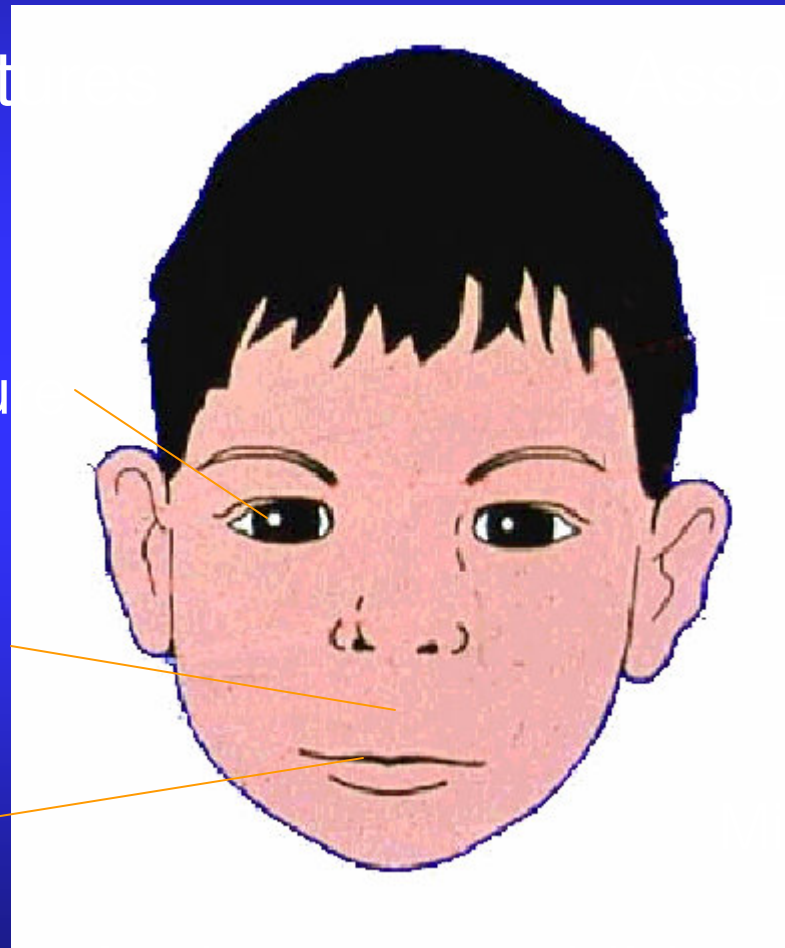
Associated Features

Epicanthal folds

Low nasal bridge

Minor ear anomalies

Micrognathia

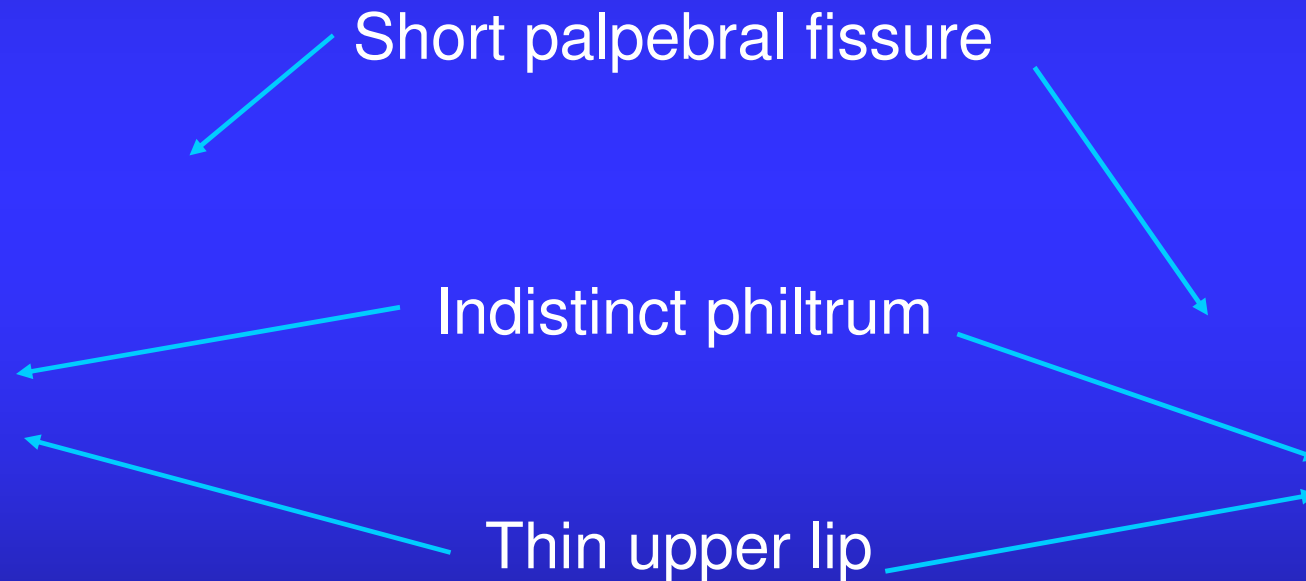


In the young child

Streissguth, 1994

# Other Examples of Children with FAS

Pictures deleted because of copyright issues





# Eye Anomalies

Examples deleted because  
of confidentiality issues

# Lip-Philtrum Guide

Examples deleted because  
of copyright issues. Please  
direct inquiries to Susan Astley  
at the University of Washington

# Hockey Stick Palmer Crease

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of confidentiality issues

# Comparison: Child with FAS and mouse fetus with fetal alcohol exposure

Child with FAS



Small head

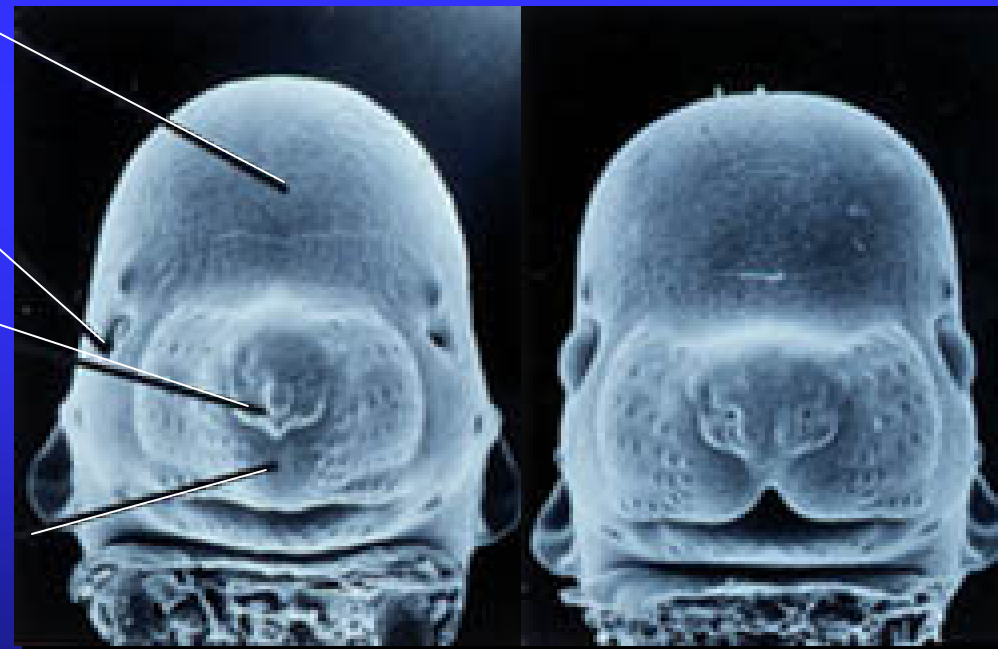
Short palpebral fissures

Small nose

Small midface

Long philtrum;  
Thin upper lip

Mouse fetuses



alcohol-exposed

normal

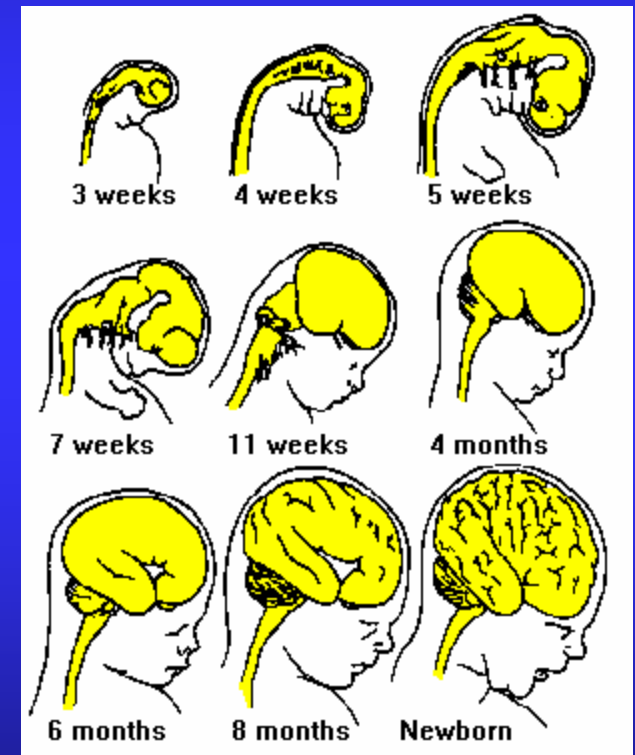
# FAS – Only the tip of the iceberg



- Fetal alcohol syndrome
- Fetal alcohol effects  
ARND/ARBD
- Appear normal but clinical suspect
- Normal, but never reaching their potential

# Fetal Alcohol Spectrum Disorders

- Reflects a continuum of prenatal alcohol effects
- Acknowledges that the facial features occur as a result of exposure during early pregnancy
- But, significant neurobehavioral deficits can result from exposure, perhaps at any time.



NIAAA, 2003



# Examples of dysmorphic FASD (FAS)

Examples deleted because  
of confidentiality issues

# Examples of nondysmorphic FASD

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of confidentiality issues

# Growing up with FAS

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of confidentiality issues

Courtesy of Ann Streissguth

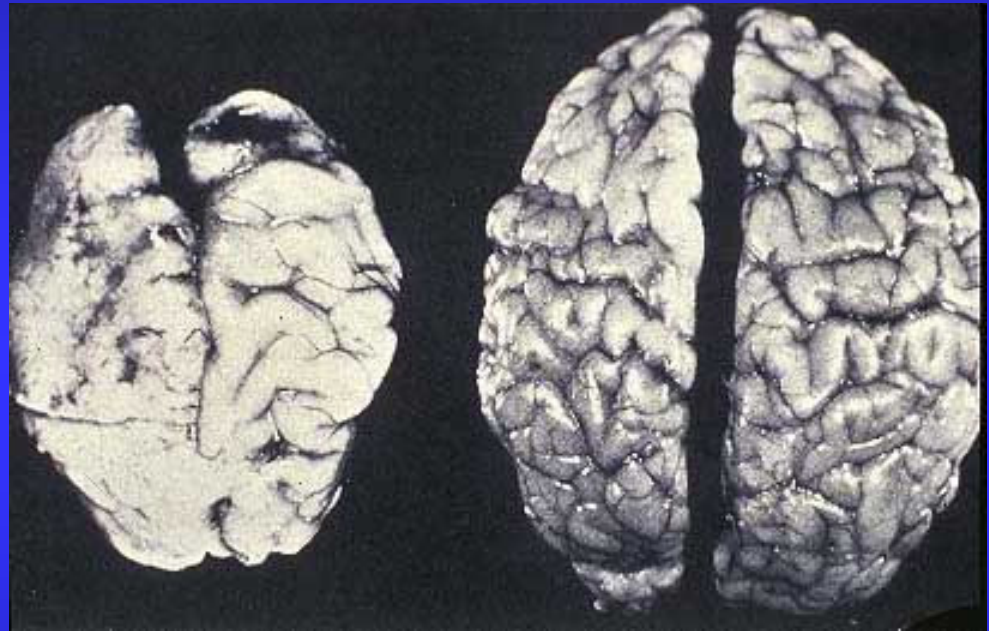
# Substance Use in Pregnancy

- Overall rates of alcohol use among pregnant women have declined since 1995. But rates of frequent and binge drinking remain at high levels.
- More than 130,000 pregnant women per year in the US consume alcohol at risk levels.
- 1 in 30 women who know they are pregnant reports “risk drinking”
- 1 in 7 women of childbearing age engage in “risk drinking”
  - Birth defects associated with alcohol exposure can occur before a woman knows she is pregnant
  - Nearly 50% pregnancies are unplanned

# Prevalence of FAS

- Different studies show prevalence rates for FAS in the US ranging from .3 to 2.2/1,000 births.
  - Some groups may be as high as 10/1000
- Each year in the US, as many as 8,800 cases of FAS occur.
  - Maybe 4 times as many affected by alcohol but without FAS (these are the nondysmorphic FASD cases)

# Five-day-old with FAS





# Autopsy findings

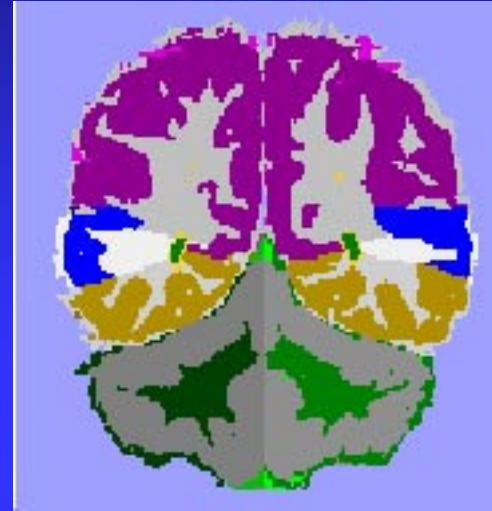
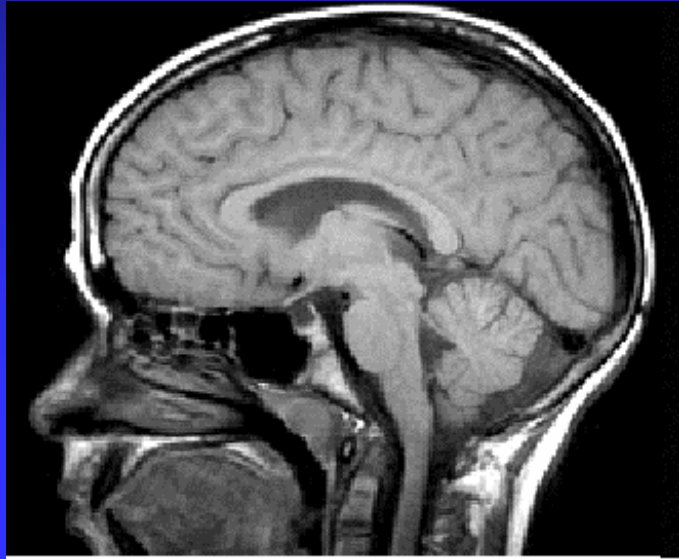
- Microcephaly
- Hydrocephaly
- Cerebral dysgenesis
- Neuroglial heterotopias
- Corpus callosum anomalies
- Ventricle anomalies
- Cerebellar anomalies

# Behavioral descriptions of children with FAS

- “too lively, ceaselessly agitated, turbulent and quarrelsome” Lemoine et al., 1968
- “tremulous, hyperactive and irritable” Jones and Smith, 1976
- “fidgety, distractible, always on the go, and never sitting still” Streissguth et al., 1978



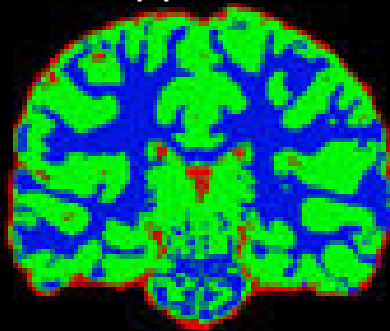
# Image Analysis



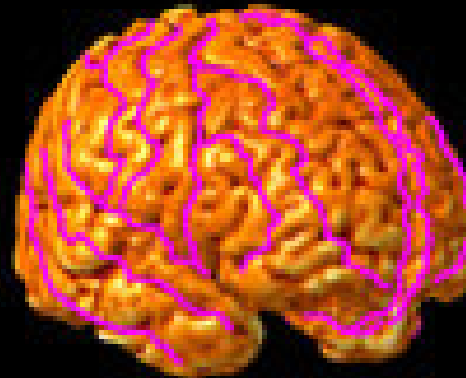
T1-Weighted



Skull stripped tissue segmented



Surface rendering



# Take Home Message 1

Picture deleted because  
of copyright issues.

Prenatal exposure to alcohol, at least high doses of alcohol, can cause permanent changes in the brain and it is these changes that underlie the behavioral problems (either directly or indirectly)

# Diagnostic Groups

- Fetal Alcohol Syndrome (FAS) - Dysmorphic FASD
  - Children with all of the required diagnostic criteria and a confirmed history of heavy prenatal alcohol exposure
- Prenatal Exposure to Alcohol (PEA) - Non Dysmorphic FASD
  - Children with a known history of significant alcohol exposure, but without the physical features necessary for a diagnosis of FAS
- Non-exposed Control (CON)
  - Children who have no history of exposure to alcohol or other known teratogens